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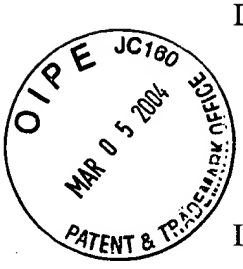

Docket No.: **1270-004**

IN THE UNITED STATES PATENT AND TRADEMARKOFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:
Richard A. McGregor

Serial No.: **09/865,346** Group Art Unit: -- 1616

Filed: May 25, 2001 Examiner: -- George, Konata M

For: **NUCLEOTIDE COMPOUNDS THAT BLOCK THE BITTER TASTE OF ORAL COMPOSITIONS**

New York, NY 10036
Date: March 2, 2004

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

Sir:

Applicant submits the present brief, in triplicate, in support of his appeal in the above captioned application, based on a final rejection dated October 3, 2003, and a Notice of Appeal filed on January 2, 2004. Reversal of the Examiner's rejections is respectfully requested based on the following arguments. The required fee of $165.00 is submitted herewith in the form of a check.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

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on : March 2, 2004

James V. Costigan, Registration No. 25,669

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I. REAL PARTY IN INTEREST

The invention of the present application is the property of Linguagen Corporation, the real party in interest, through assignment from the inventor.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellant or its legal representatives.

III. STATUS OF CLAIMS

Claims 8, 13, 21 and 26-31 are the only claims pending in the present application. The rejection of these claims is appealed herein.

IV. STATUS OF AMENDMENTS

An Amendment to the Claims of the instant application was filed August 7, 2003, subsequent to the Examiner's rejection May 7, 2003.

V. SUMMARY OF INVENTION

The presently claimed invention is directed to a composition and a method for inhibiting the sensory perception of bitterness. The inhibitors of the invention may be used as flavor enhancers in foods and beverages. The present invention is based, at least in part, on the discovery that nucleotide compounds are capable of inhibiting the activation of G-proteins involved in the perception of bitterness. The inhibitors of this invention when administered to a subject in an effective amount may be used as flavor enhancers in foods and beverages to overcome their bitter taste. Wherein, the inhibitor is a purine or pyrimidine group, or derivative thereof, and an ionizable phosphate or other anionic organic molecule.

VI. ISSUES

The issue on appeal is whether Claims 8, 13, 21 and 26-31 are as presently amended, unpatentable under 35 U.S.C. 102 (b) as being anticipated by Kohjin (JP 11-169131).

VII. GROUPING OF CLAIMS

All of the claims in the present application stand and fall together.

VIII. ARGUMENT

The presently claimed invention is directed to a composition and a method for inhibiting the sensory perception of bitterness. The inhibitors of the invention may be used as flavor enhancers in natural, cooked and processed foods and beverages. The present invention is based, at least in part, on the discovery that nucleotide compounds are capable of inhibiting the activation of G-proteins involved in the perception of bitterness. The inhibitors of this invention when administered to a subject in an effective amount may be used as flavor enhancers in foods and beverages to overcome their bitter taste. Wherein, the inhibitor is a purine or pyrimidine group, or derivative thereof, and an ionizable phosphate or other anionic organic molecule.

It is well documented in the scientific literature that, the sense of taste can be divided into five predominant categories: bitter, salty, sour, sweet and umami (the Japanese word describing the taste of monosodium glutamate; Herness, M.S. & Gilbertson, T.A., 1999, *Annu. Rev. Physiol.* 61:873-900). The presently claimed invention inhibits bitter taste perception, specifically, and not the taste perceptions of salty, sour, sweet or umami.

In sharp contrast, Kohjin discloses a technique of masking the "taste, acidity, and a scent from the salt of food" by using 5'uridylic acid sodium or 5' cytidylic acid sodium. (see Kohjin at paragraphs [0001]-[0006]) Specifically, Kohjin describes in paragraph [0007] examples of food such as "miso soup, ... bitter orange juice...", and continues to describe such sour and salty foods as those foods "with a pungent taste- - A vinegar,

bitter orange juice, ... such as food which has acidity, such as fruit-juice, such as lemon and an orange..."

An examination of the literature teaches that the term "bitter orange juice" is a synonym for the **sour juice of genus/species Citrus aurantium orange**. More specifically, as described in *Fruits of Warm Climates, Sour Orange*, by Julia F. Morton, pgs 130-133, (see Exhibit A), the Citrus aurantium or "sour orange" variety of oranges has the common name **bitter orange**, which has incorrectly lead to the term "bitter orange juice". Because of the high concentration of citric acid in this variety of oranges, they have very **sour** characteristics and are not used to make orange juice. The "sour orange" is most commonly used in the manufacturing of marmalade because of its sour characteristics. As such, orange-juice is usually made from a variety of oranges of the genus/species Citrus sinensis, or its common name "sweet oranges".

Notably, the taste of orange juice results from its: brix content, or the measure of soluble sugars in the juice which provides the sweet flavor; and acid which provides for its **sour taste**.

It is important to distinguish that technically the taste of orange-juice is provided by the combination of sugars (sweet sense of taste) and acids (sour sense of taste). Significantly, the acid in the juice provides for a **sour taste sensation and must be distinguished from a bitter taste sensation**. Moreover, the juice of the orange does not contain bitter tastants, but rather **sour tastants** in the form of citrus acids. As previously noted, bitter taste sensations and not sour taste sensation are perceived and effectuated by G protein specific neurological pathways.

The presently claimed invention discloses a novel method which "abrogate the perception of bitterness of bitter tastants" (see Specification page 6, lines 1-2, Claims 8, 13, 21 and 26), by inhibiting the activation of G-proteins by bitter tastant-stimulated taste receptors and results in responses which indicate that the sensation of bitterness is diminished (see Specification at page 5, paragraph [0009]).

The food examples disclosed in Kohjin are limited to the sensory perceptions of salt, umami and sour, **and not bitter tasting foods**. The first of these three sensory effects is measured in Example 7 which "evaluated acidity by the ranking method," and the results are shown in Table 3. (see Kohjin at paragraph [0018]). Examples 4, 5, 8 and 9 further demonstrate Kohjin's use UMP and CMP to mask the "acid" taste of various foods consumed by the participants in these experiments. (see Kohjin at paragraphs [0020] and [0021]). Further, Tables 4 and 5 display the results of organoleptic testing of "a scent" as experienced by the participants who sampled Examples 6, 8, 10, 12 and 14. (see Kohjin at paragraph [0023] through [0029]). Lastly, Kohjin describes the organoleptic testing of "a salt - - the ranking method", with the use of Examples 1-3, and the results are shown in Table 1. (see Kohjin at paragraph [0012]).

As noted in the "Effect of the Invention," the cited prior art relates to "scent/the taste, acidity or... from the salt of food by what UMP or CMP is added", (see Kohjin at paragraph [0030]), and not as an inhibitor of bitterness in food or beverages.

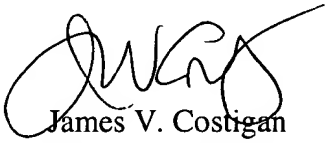
The Applicant maintains that the Kohjin reference teaches the use of 5'-uridylic acid sodium (UMP) and 5'-cytidylic-acid sodium (CMP) for masking the **salty, sour taste sensations of food, and <u>not</u> as a bitterness inhibitor**. These taste sensations are perceived and effectuated by sensory pathways other than G protein specific neurological pathways. Applicant acknowledges that Kohjin does refer to "bitter orange juice." However, after an assessment of the supporting literature, one skilled in the art would conclude that this phrase refers to the juice from the *Citrus aurantium* orange which has a sour taste sensation and is not bitter. Moreover, Kohjin categorizes these foods "such as food which has acidity, such as fruit-juice drinks, such as lemon and an orange," all having **sour taste sensations** which can be "masked" by 5'-uridylic acid sodium (UMP) and 5'-cytidylic-acid sodium (CMP). (see Kohjin, paragraph [0007]).

A prima facie case of anticipation, according to the Federal Circuit, "requires the presence in a single prior art disclosure of each and every element of the claimed invention." *Lewmar Marine v. Barient, Inc.* 3 U.S.P.Q.2d 1766, 1767 (Fed. Cir. 1987). In the final rejection, the Examiner, at page 3, line 3, urged that the composition of the prior art would have the same inherent properties as the claimed invention. This application of the law of inherent anticipation is in error because the claimed compositions are novel and inherent anticipation has no applicability when novel compositions are involved. *In re Robertson*, 49 USPQ 2d 1949 (Fed. Cir. 1999) In addition, when inherency is at issue, more than a probability that some event will always happen, must be demonstrated. *Trintec Indus. Inc. v. Top-U.S.A. Corp.* 63 USPQ 2d 1597 (Fed. Cir. 2002)

As noted *supra*, the food compositions described by Kohjin are salty or acid while the present claims are drawn to foods and beverages that have a bitter taste. None of the foods or beverages described by Kohjin have a bitter taste and this fact is persuasive evidence of the novelty of the subject matter defined by the claims set forth in the Appendix. Upon comparison to the present invention, it must be pointed out that the Kohjin reference clearly does not teach inhibiting the bitter taste of a bitter tastant. For these reasons the § 102(b) rejection over Kohjin is improper, and should be reversed.

Based on the above, applicant respectfully submits that all of the pending claims are not indefinite and that the rejection under 35 U.S.C. § 112, second paragraph, should be reversed, and patent protection allowed to a novel and unobvious advance in the art.

Respectfully submitted,



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IX. APPENDIX

Claim 8 A composition comprising a bitter tastant selected from the group comprising foods and beverages, and a bitterness inhibitor, wherein said bitterness inhibitor is uridine 5'-monophosphate and the inhibitor is present at a concentration which inhibits bitterness.

Claim 13 A composition comprising a bitter tastant selected from the group comprising foods and beverages, and a bitterness inhibitor, wherein said bitterness inhibitor is a purine or pyrimidine group, or derivative thereof, and ionizable phosphate or other anionic organic molecule and the inhibitor is present at a concentration which inhibits bitterness.

Claim 21 A method of inhibiting the perception of a bitter taste of a food or beverage in a subject comprising administering to the subject an effective amount of a bitterness inhibitor wherein said inhibitor is uridine 5'-monophosphate.

Claim 26 A method of inhibiting the perception of a bitter taste of a food or beverage in a subject comprising administering to the subject an effective amount of a bitterness inhibitor wherein said inhibitor is a purine or pyrimidine group, or derivative thereof, and ionizable phosphate or other anionic organic molecule.

Claim 27 A composition consisting essentially of a bitter tastant selected from the group comprising foods and beverages, and a bitterness inhibitor, wherein said bitterness inhibitor is uridine 5'-monophosphate and the inhibitor is present at a concentration which inhibits bitterness.

Claim 28 A method of inhibiting the perception of a bitter taste of a food or beverage in a subject, said method consisting essentially of administering to the subject an effective amount of a bitterness inhibitor in a composition which consisting essentially of a bitter tastant and bitterness inhibitor wherein said inhibitor is uridine 5'-monophosphate.

Claim 29 A method of inhibiting the perception of a bitter taste of a food or beverage in a subject consisting essentially of administering to the subject an effective amount of a bitterness inhibitor in a composition which consists essentially of a bitter tastant and bitterness inhibitor wherein said inhibitor is a purine or pyrimidine group, or derivative thereof, and ionizable phosphate or other anionic organic molecule.

Claim 30 The composition of Claim 8, wherein said bitter tastant consists essentially of a bitter food, wherein said bitterness inhibitor is uridine 5'-monophosphate and the inhibitor is present at a concentration which inhibits bitterness.

Claim 31 The composition of Claim 8, wherein said bitter tastant consists essentially of a bitter beverage, wherein said bitterness inhibitor is uridine 5'-monophosphate and the inhibitor is present at a concentration which inhibits bitterness.

Morton, J. 1987. Sour Orange. p. 130–133. In: Fruits of warm climates. Julia F. Morton, Miami, FL.

Sour Orange

Citrus aurantium

A species of multiple uses, the sour orange *(Citrus aurantium,* L.), is also known as bitter, bigarade, or Seville orange. In Spanish-speaking areas it may be called *naranja ácida, naranja agria,* or *naranja amarga.* In Arabia, it is *naranji;* in Italy, *melangolo;* in India, *khatta;* in Samoa, *moli,* in Guam, soap orange.

Description

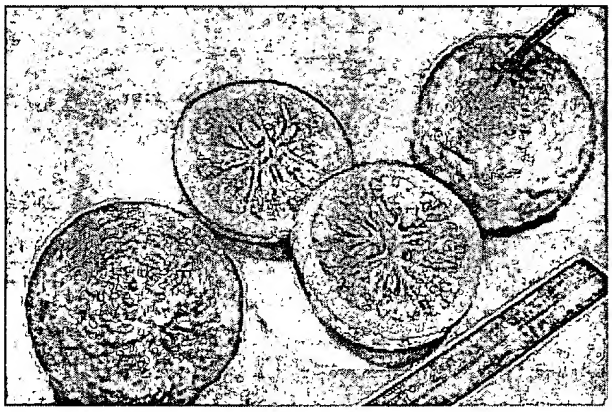

Fig. 35: The sour orange *(Citrus aurantium)*has a rough, fairly thick skin, very sour juice.

The tree ranges in height from less than 10 ft (3 m) to 30 ft (9 m), is more erect and has a more compact crown than the sweet orange; has smooth, brown bark, green twigs, angular when young, and flexible, not very sharp, thorns from 1 in to 3 1/8 in (2.5-8 cm) long. The evergreen leaves (technically single leaflets of compound leaves), are aromatic, alternate, on broad-winged petioles much longer than those of the sweet orange; usually ovate with a short point at the apex; 2 1/2 to 5 1/2 in (6.5-13.75 cm) long, 1 1/2 to 4 in (3.75-10 cm) wide; minutely toothed; dark-green above, pale beneath, and dotted with tiny oil glands. The highly fragrant flowers, borne singly or in small clusters in the leaf axils, are about 1 1/2 in (3.75 cm) wide, with 5 white, slender, straplike, recurved, widely-separated petals surrounding a tuft of up to 24 yellow stamens. From 5 to 12% of the flowers are male.

The fruit is round, oblate or oblong-oval, 2 3/4 to 3 1/8 in (7-8 cm) wide, rough-surfaced, with a fairly

thick, aromatic, bitter peel becoming bright reddish-orange on maturity and having minute, sunken oil glands. There are 10 to 12 segments with bitter walls containing strongly acid pulp and from a few to numerous seeds. The center becomes hollow when the fruit is full-grown.

Origin and Distribution

The sour orange is native to southeastern Asia. Natives of the South Sea Islands, especially Fiji, Samoa, and Guam, believe the tree to have been brought to their shores in prehistoric times. Arabs are thought to have carried it to Arabia in the 9th Century. It was reported to be growing in Sicily in 1002 A.D., and it was cultivated around Seville, Spain, at the end of the 12th Century. For 500 years, it was the only orange in Europe and it was the first orange to reach the New World. It was naturalized in Mexico by 1568 and in Brazil by 1587, and not long after it was running wild in the Cape Verde Islands, Bermuda, Jamaica, Puerto Rico and Barbados. Sir Walter Raleigh took sour orange seeds to England; they were planted in Surrey and the trees began bearing regular crops in 1595, but were killed by cold in 1739.

Spaniards introduced the sour orange into St. Augustine, Florida. It was quickly adopted by the early settlers and local Indians and, by 1763, sour oranges were being exported from St. Augustine to England. Sour orange trees can still be found in Everglades hammocks on the sites of former Indian dwellings. The first sweet orange budwood was grafted onto sour orange trees in pioneer dooryards and, from that time on, the sour orange became more widely grown as a rootstock in all citrus-producing areas of the world than for its fruit or other features. Today, the sour orange is found growing wild even in southern Georgia and from Mexico to Argentina.

It is grown in orchards or groves only in the Orient and the various other parts of the world where its special products are of commercial importance, including southern Europe and offshore islands, North Africa, the Middle East, Madras, India, West Tropical Africa, Haiti, the Dominican Republic, Brazil and Paraguay.

Varieties

There are various well-established forms of the sour orange. In the period 1818-1822, 23 varieties were described and illustrated in Europe. A prominent subspecies is the Bergamot orange, C. *aurantium,* var. *bergamia* Wight & Arn., grown in the Mediterranean area since the 16th Century but commercially only in Italy. Trees grown in California and Florida under this name are actually the 'Bouquet' variety of sour orange (see below). The flowers of the Bergamot are small, sweetly fragrant; the fruits round or pear-shaped, with strongly aromatic peel and acid pulp.

The myrtle-leaved orange (C. *aurantium,* var. *myrtifolia),* is a compact shrub or tree with small leaves and no thorns. It was found as a bud mutation on trunks of old sour orange trees in Florida. It is propagated and grown only on the French and Italian Riviera for its small fruits which are preserved in brine and exported for candying.

Apart from these special types, there are several groups of sour oranges, within which there are placed certain cultivars:

1) *Normal group* (large, seedy fruits)

'African', 'Brazilian', 'Rubidoux', 'Standard', 'Oklawaha' and 'Trabut'. 'Oklawaha' originated in the United States. It has large fruits rich in pectin and is prized for marmalade.

2) Aberrant group

'Daidai', or 'Taitai', popular in Japan and China. Its fruits are large with very thick peel, very acid pulp, and many seeds. The tree is somewhat dwarf and almost thornless; immune to citrus canker in the Philippines. It is prized for its flower buds which are dried and mixed with tea for their scent.

'Goleta' has medium-large fruits with juicy, medium-sour pulp and very few seeds. The tree is of medium size and almost thornless.

'Bouquet' has small, deep-orange fruits, acid, with few seeds. The tree is less than 10 ft (3 in) high and is grown as an ornamental.

3) *Bittersweet group* includes any sweet-acid forms of the sour orange introduced by Spaniards and formerly found growing in the Indian River region of Florida. These oranges are often seen in a naturalized state in the West Indies. The peel is orange-red, the pulp is darker in hue than that of the normal sour orange.

'Paraguay' was introduced from Paraguay in 1911. The fruit is of medium size, with sweet pulp, moderately seedy. The tree is large, thorny and hardy.

Among other forms of sour orange, there is in India a type called 'Karna', 'Khatta' or 'Id Nimbu', identified as *C. aurantium* var. *khatta* (or *C. karna* Raf.) but suspected of being a hybrid of sour orange and lemon. The fruits are typical sour oranges but the flowers are red-tinted like those of the lemon.

Two cultivars are grown as rootstocks for the sweet orange in China:

'Vermilion Globe' has oblate fruits containing 30 to 40 seeds. The tree has long, narrow, pointed

'Leather-head' has small, oblate, rough fruits with 20 seeds. The tree has elliptic, blunt leaves.

Cultivars grown especially for the production of Neroli oil in France and elsewhere, have flowers in large, more concentrated clusters than the ordinary types of sour orange. One of these, 'Riche Défouille', has unusual, wingless leaves.

Climate

The sour orange flourishes in subtropical, near-tropical climates, yet it can stand several degrees of frost for short periods. Generally it has considerable tolerance of adverse conditions. But the Bergamot orange is very sensitive to wind and extremes of drought or moisture.

Soil

Unlike its sweet relative, the sour orange does well on low, rich soils with a high water table and is adapted to a wide range of soil conditions.

Propagation

Sour orange trees volunteer readily from self-sown seeds. As generally grown for rootstock for sweet oranges, they are raised in nurseries for 1 or 2 years and then budded. Growth of the seedlings, especially in diameter, has been expedited by weekly applications of gibberellic acid to the stems,

making it possible to bud them much earlier.

Culture

In the proper climatic and soil conditions, the sour orange is self-maintaining and receives only a modicum of cultural attention. It has an extraordinary ability to survive with no care at all. Some trees in Spain are said to be over 600 years old and one tree in a tub at Versailles, which, of course, must be carefully tended, was reportedly planted in the year 1421.

Pests and Diseases

The sour orange is subject to most of the pests that attack the sweet orange. In addition to its susceptibility to the disease called tristeza, the tree is liable to other viruses -crinkly leaf, gummy bark, psorosis, and xyloporosis. The Division of Plant Industry of the Florida State Department of Agriculture has recorded the following fungal problems as sometimes seen: leaf spot (*Alternaria citri, Cercospora penzigii, Mycophaerella horii, Cladosporium oxysporum,* and *Phyllosticta hesperidearum);* greasy spot *(Cercospora citri-grisea);* tar spot (C. *gigantea);* leprosis *(Cladosporium herbarum);* mushroom root rot *(Clitocybe tabescens);* anthracnose *(Colletotrichum gloeosporioides);* thread blight *(Corticium koleroga* and C. *stevensii);* gummosis and dieback *(Diaporthe citri);* foot rot and root rot *(Fusarium oxysporum, Macrophomia phaseolina, Phytophthora* spp.); heart rot and wood rot *(Fomes applanatus, Ganoderma sessilis, Xylaria polymorpha),* and others.

Food Uses

The normal types of sour orange are usually too sour to be enjoyed out-of-hand. In Mexico, however, sour oranges are cut in half, salted, coated with a paste of hot chili peppers, and eaten.

The greatest use of sour oranges as food is in the form of marmalade and for this purpose they have no equal. The fruits are largely exported to England and Scotland for making marmalade. Sour oranges are used primarily for marmalade in South Africa.

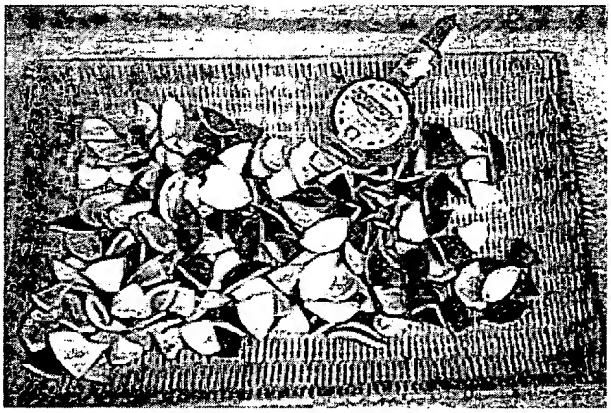

Fig. 36: Dried peel of the locally-grown sour orange yields the essential oil that flavors "Curacao liqueur".

The juice is valued for ade and as a flavoring on fish and, in Spain, on meat during cooking. In Yucatan, it is employed like vinegar. In Egypt and elsewhere, it has been fermented to make wine.

"Bitter orange oil", expressed from the peel, is in demand for flavoring candy, ice cream, baked goods, gelatins and puddings, chewing gum, soft drinks, liqueurs and pharmaceutical products, especially if the water-or alcohol-insoluble terpenes and sesquiterpenes are removed. The oil is produced in Sicily, Spain, West Africa, the West Indies, Brazil, Mexico and Taiwan.

The essential oil derived from the dried peel of immature fruit, particularly from the selected types - 'Jacmel' in Jamaica and the much more aromatic 'Curacao orange' (var. *curassaviensis)-gives* a distinctive flavor to certain liqueurs.

"Neroli oil", or "Neroli Bigarade Oil", distilled from the flowers of the sour orange, has limited use in flavoring candy, soft-drinks and liqueurs, ice cream, baked goods and chewing gum.

'Petitgrain oil', without terpenes, is used to enhance the fruit flavors (peach, apricot, gooseberry, black currant, etc.) in food products, candy, ginger ale, and various condiments.

'Orange leaf absolute' enters into soft-drinks, ice cream, baked goods and candy.

The ripe peel of the sour orange contains 2.4 to 2.8%, and the green peel up to 14%, neohesperidin dihydrochalcone which is 20 times sweeter than saccharin and 200 times sweeter than cyclamate. Potential use as a sweetener may be hampered by the limited supply of peel.

Food Value Per 100 g of Edible Portion

	Fruit (raw)	*Fruit (raw, with only superficial layer of peel removed)**
Calories	37-66	
Moisture	83-89.2 g	77.8-83.1 g
Protein	0.6-1.0 g	0.154-0.167 g
Fat	trace-0.1 g	0.05-0.07 g
Carbohydrates	9.7-15.2 g	?
Fiber	0.4 g	1.8-2.2 g
Ash	0.5 g	0.57-0.69 g
Calcium	18-50 mg	64.3-81.9 mg
Iron	0.2 mg	0.22-0.85 mg
Phosphorus	12 mg	19.6-20.4 mg
Vitamin A	290 mcg or 200 I.U.	0.055-0.07 mg
Thiamine	100 mcg	0.048-0.059 mg
Riboflavin	40 mcg	0.030-0.040 mg
Niacin	0.3 mg	0.282-0.400 mg
Ascorbic Acid	45-90 mg	55.2-103.5 mg
*Sampled in Guatemala and El Salvador.		

Other Uses

Soap substitute: Throughout the Pacific Island, the crushed fruit and the macerated leaves, both of which make lather in water, are used as soap for washing clothes and shampooing the hair. Safford described the common scene in Guam of women standing in a river with wooden trays on which they rub clothing with sour orange pulp, then scrub it with a corncob. He wrote: "Often the entire surface of the river where the current is sluggish is covered with decaying oranges." On the islands of Zanzibar and Pemba, the fruits are used for scouring floors and brass.

Perfumery: All parts of the sour orange are more aromatic than those of the sweet orange. The flowers are indispensable to the perfume industry and are famous not only for the distilled Neroli oil but also for "orange flower absolute" obtained by fat or solvent extraction. During favorable weather in southern

France, 2,200 lbs (1,000 kg) of flowers will yield 36 to 53 oz (1,000-1,500 g) of oil.

Neroli oil consists of 35% terpenes (mainly dipentene, pinene and camphene), 30% *l*-linalool, and 4% geraniol and nerol, 2% *d*-terpineol, 6% *d*-nerolidol, traces of decyclic aldehyde, 7% *l*-linalyl acetate, 4% neryl and geranyl acetates, traces of esters of phenylacetic acid and benzoic acid, as much as 0.1% methyl anthranilate, and traces of jasmone, farnesol, and palmitic acid. Orange flower water is usually a by-product of oil production.

Petitgrain oil is distilled from the leaves, twigs and immature fruits, especially from the Bergamot orange. Both Petitgrain and the oil of the ripe peel are of great importance in formulating scents for perfumes and cosmetics. Petitgrain oil is indispensable in fancy eau-de-cologne. The seed oil is employed in soaps.

Honey: The flowers yield nectar for honeybees.

Wood: The wood is handsome, whitish to pale-yellow, very hard, fine-grained, much like boxwood. It valued for cabinetwork and turnery. In Cuba it is fashioned into baseball bats.

Medicinal Uses: Sour orange juice is antiseptic, anti-bilious and hemostatic. Africans apply the cut-open orange on ulcers and yaws and areas of the body afflicted with rheumatism. In Italy, Mexico and Latin America generally, decoctions of the leaves are given for their sudorific, antispasmodic, stimulant, tonic and stomachic action. The flowers, prepared as a sirup, act as a sedative in nervous disorders and induce sleep. An infusion of the bitter bark is taken as a tonic, stimulant, febrifuge and vermifuge.

The fresh young leaves contain as much as 300 mg of ascorbic acid per 100 g. The mature leaf contains 1-stachyhydrine.

Last updated: 4/2/99 by ch